

ATTACHMENT 1

**SUMMARY OF BIOAVAILABILITY ISSUES FOR ARSENIC
IN BAYOU VERDINE HHRA**

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A Baseline Human Health Risk Assessment (HHRA) dated April 12, 2001, was prepared by ENTRIX and included as Volume IV in the Bayou Verdine Investigation documents submitted to USEPA Region VI for review. In this evaluation, tissue samples for fish and shellfish had been collected from Bayou Verdine, and analyzed for total arsenic. The HHRA assumed that hypothetical recreational users of the bayou might in the future consume fish or shellfish from that source. The HHRA also assumed that 100% of the total arsenic detected in tissue was available to humans as inorganic arsenic, and risks were estimated accordingly. The cancer slope factor for arsenic applies to the inorganic form of arsenic only, not organic forms. The USEPA provided comments on the HHRA in June 2001, indicating that arsenic in tissue is typically not 100% inorganic. Comment 16(b) noted:

The arsenic in edible parts of fish and shellfish is predominantly present as the arsenic-containing organic compound arsenobetaine. Arsenobetaine is metabolically inert and nontoxic. Therefore, the carcinogenic and noncarcinogenic risk from the consumption of fish and shellfish attributed to arsenic may be overestimated.

ENTRIX conducted modification of the risks to reflect bioavailability of only the inorganic form of arsenic in fish and shellfish tissue. A literature search indicated that edible parts of fish and shellfish can contain up to 10 to 25% inorganic arsenic, and some studies showed between 1 and 10% (see references below). The rest of the total arsenic in tissue is present in its metabolically inert, nontoxic, organic forms (arsenobetaine and arsenocholine). Therefore, carcinogenic and noncarcinogenic risks were revised to adjust for the overestimation in the HHRA of risk associated with the consumption of inorganic arsenic in fish and shellfish.

Exposure point concentrations for arsenic in tissue were revised to conservatively reflect the upper end of the literature range, and 25% of the total arsenic concentration in tissue was used to represent an upper bound concentration for inorganic arsenic. Results of the recalculations of risks for arsenic reduced the total values for cancer risks and hazard indices for each receptor. However, the change was not dramatic, and the status of the values relative to target risk levels for the different receptor and exposure scenarios did not change. For example, if the original risk estimate for the reasonable maximum exposure for recreational or subsistence consumption of biota was above the target cancer risk of one in a million, the revised value was also. Similarly, if the

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hazard index for noncancer effects for a receptor was above the threshold of 1, the revised value was also. Values that were below the target risk values were reduced, so they also remained below the risk benchmarks.

In September 2001, ENTRIX provided documentation of this revision of the arsenic bioavailability for the Bayou Verdone HHRA to USEPA in written responses to comments. In October, 2001, USEPA provided a written reply to those comment responses, and agreed with ENTRIX's approach for reevaluation of risks associated with arsenic in fish and shellfish tissue.

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